

WHAT IS CLAIMED IS:

1. A method for surface production of gas from a subterranean zone, comprising:

forming a drainage pattern in a subsurface zone, the drainage pattern comprising a plurality of cooperating bores and having a coverage area extending between the cooperating bores;

lowering water pressure throughout the coverage area of the subsurface zone without significant subsurface drainage by producing water through the cooperating bores of the drainage pattern to the surface; and

producing gas from the coverage area of the subsurface zone with at least some of the water.

2. The method of Claim 1, further comprising lowering water pressure throughout the coverage area of the subsurface zone with no subsurface drainage.

3. The method of Claim 1, further comprising lowering water pressure throughout the coverage area of the subsurface zone while a subsurface aquifer continues to supply additional water to the coverage area.

4. The method of Claim 1, further comprising substantially uniformly dropping water pressure throughout the coverage area of the subsurface zone by producing water through the cooperating bores of the drainage pattern to the surface.

5. The method of Claim 1, further comprising producing gas from the coverage area of the subsurface zone in two-phase flow with at least some of the water.

6. The method of Claim 1, wherein the gas comprises methane.

5           7. The method of Claim 6, wherein the drainage pattern is formed in virgin reservoir conditions, further comprising producing the methane in a self sustaining flow.

10           8. The method of Claim 7, further comprising reaching a maximum gas production rate within four months of a start of water production.

15           9. The method of Claim 6, further comprising producing a bulk of recovered methane within six months of a start of water production.

20           10. The method of Claim 1, wherein the drainage pattern comprises a pinnate drainage pattern.

25           11. The method of Claim 1, wherein the coverage area comprises a substantially polygonal area of the subsurface zone.

30           12. The method of Claim 1, wherein the coverage area comprises a substantially square area of the subsurface zone.

          13. The method of Claim 1, wherein the coverage area comprises a substantially non-disjointed area of the subsurface zone.

14. The method of Claim 1, wherein the coverage area comprises a substantially ellipsoidal area of the subsurface zone.

5        15. The method of Claim 1, wherein the coverage area comprises a substantially symmetrical area of the subsurface zone.

10        16. The method of Claim 1, wherein the coverage area comprises a shape operable to be nested between a plurality of similarly shaped coverage areas.

15        17. The method of Claim 1, wherein the coverage area extends to any point in the subsurface zone horizontally between any two of the cooperating bores.

18. The method of Claim 1, wherein the subsurface zone comprises a coal bed.

20        19. The method of Claim 18, wherein over fifty percent of the coverage area is horizontally spaced apart from any cooperating bore by distance of greater than 200 feet.

25        20. The method of Claim 4, wherein the pressure differential within the coverage area is less than or equal to 10 pounds per square inch (psi).

30        21. The method of Claim 1, further comprising:  
          producing water through the cooperating bores of the drainage pattern to a cavity; and  
          lifting water from the cavity to the surface.

22. The method of Claim 21, wherein the cavity comprises a volume greater than or equal to 1000 cubic feet.

5        23. The method of Claim 21, wherein the cavity has a horizontal area greater than or equal to 50 square feet.

10       24. The method of Claim 1, wherein a plurality of the cooperating bores are substantially parallel to each other.

15       25. The method of Claim 21, wherein the coverage area extends to a periphery of the drainage pattern defined by a distal end of all the cooperating bores.

26. A method for surface production of gas from a subterranean zone, comprising:

forming a drainage pattern in a subsurface zone, the drainage pattern comprising a plurality of cooperating bores and having a coverage area extending between the cooperating bores;

substantially uniformly dropping water pressure throughout the coverage area of the subsurface zone without significant subsurface drainage by producing water through the cooperating bores of the drainage pattern to the surface; and

producing gas from the coverage area of the subsurface zone in two-phase flow with the water.

27. The method of Claim 26, further comprising dropping water pressure a rate operable to cause released gas to propel water removal from the coverage area.

28. The method of Claim 26, further comprising lowering water pressure throughout the coverage area of the subsurface zone while a subsurface aquifer continues to supply additional water to the coverage area.

29. The method of Claim 26, wherein the gas comprises methane.

30. The method of Claim 29, wherein the drainage pattern is formed in virgin reservoir conditions, further comprising producing the methane in self sustaining flow.

31. The method of Claim 30, further comprising reaching a maximum gas production rate within four months of a start of water production.

32. The method of Claim 26, wherein the coverage area comprises a substantially non-disjointed area of the subsurface zone.

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33. The method of Claim 29, further comprising producing a bulk of recovered methane within six months of a start of water production.

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34. The method of Claim 26, wherein the coverage area comprises a substantially symmetrical area of the subsurface zone.

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35. The method of Claim 26, wherein the coverage area extends to any point in the subsurface zone horizontally between any two of the cooperating bores.

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36. The method of Claim 26, wherein the pressure differential within the coverage area is less than or equal to 10 pounds per square inch (psi).

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37. The method of Claim 26, further comprising:  
producing water through the cooperating bores of the drainage pattern to a cavity; and  
lifting water from the cavity to the surface.

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38. The method of Claim 37, wherein the cavity comprises a volume greater than or equal to 1000 cubic feet.

39. The method of Claim 37, wherein the cavity has a horizontal area greater than or equal to 50 square feet.

40. A system for surface production of gas from a subterranean zone, comprising:

means for forming a drainage pattern in a subsurface zone, the drainage pattern comprising a plurality of cooperating bores and having a coverage area extending between the cooperating bores;

means for lowering water pressure throughout the coverage area of the subsurface zone without significant subsurface drainage by producing water through the cooperating bores of the drainage pattern to the surface; and

means for producing gas from the coverage area of the subsurface zone with at least some of the water.

41. The system of Claim 40, further comprising means for lowering water pressure throughout the coverage area of the subsurface zone with no subsurface drainage.

42. The system of Claim 40, further comprising means for lowering water pressure throughout the coverage area of the subsurface zone while a subsurface aquifer continues to supply additional water to the coverage area.

43. The system of Claim 40, further comprising means for substantially uniformly dropping water pressure throughout the coverage area of the subsurface zone by producing water through the cooperating bores of the drainage pattern to the surface.

44. The system of Claim 40, further comprising means for producing gas from the coverage area of the

subsurface zone in two-phase flow with at least some of the water.

45. The system of Claim 40, wherein the gas  
5 comprises methane.

46. The system of Claim 45, wherein the drainage  
pattern is formed in virgin reservoir conditions, further  
comprising producing the methane in a self sustaining  
10 flow.

47. The system of Claim 46, further comprising  
reaching a maximum gas production rate within four months  
of a start of water production.  
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48. The system of Claim 45, further comprising  
producing a bulk of recovered methane within six months  
of a start of water production.

49. The system of Claim 40, wherein the drainage  
pattern comprises a pinnate drainage pattern.  
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50. The system of Claim 40, wherein the coverage  
area comprises a substantially polygonal area of the  
subsurface zone.  
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51. The system of Claim 40, wherein the coverage  
area comprises a substantially square area of the  
subsurface zone.  
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52. The system of Claim 40, wherein the coverage  
area comprises a substantially non-disjointed area of the  
subsurface zone.



53. The system of Claim 40, wherein the coverage area comprises a substantially ellipsoidal area of the subsurface zone.

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54. The system of Claim 40, wherein the coverage area comprises a substantially symmetrical area of the subsurface zone.

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55. The system of Claim 40, wherein the coverage area comprises a shape operable to be nested between a plurality of similarly shaped coverage areas.

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56. The system of Claim 40, wherein the coverage area extends to any point in the subsurface zone horizontally between any two of the cooperating bores.

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57. The system of Claim 40, wherein the subsurface zone comprises a coal bed.

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58. The system of Claim 57, wherein over fifty percent of the coverage area is horizontally spaced apart from any cooperating bore by distance of greater than 200 feet.

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59. The system of Claim 43, wherein the pressure differential within the coverage area is less than or equal to 10 pounds per square inch (psi).

60. The system of Claim 40, further comprising:  
means for producing water through the cooperating bores of the drainage pattern to a cavity; and

means for lifting water from the cavity to the surface.

61. The system of Claim 60, wherein the cavity  
5 comprises a volume greater than or equal to 1000 cubic feet.

62. The system of Claim 60, wherein the cavity has a  
horizontal area greater than or equal to 50 square feet.  
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63. The system of Claim 40, wherein a plurality of  
the cooperating bores are substantially parallel to each  
other.

64. The system of Claim 60, wherein the coverage  
area extends to a periphery of the drainage pattern  
defined by a distal end of all the cooperating bores.  
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65. A system for surface production of gas from a subterranean zone, comprising:

means for forming a drainage pattern in a subsurface zone, the drainage pattern comprising a plurality of cooperating bores and having a coverage area extending between the cooperating bores;

means for substantially uniformly dropping water pressure throughout the coverage area of the subsurface zone without significant subsurface drainage by producing water through the cooperating bores of the drainage pattern to the surface; and

means for producing gas from the coverage area of the subsurface zone in two-phase flow with the water.

66. The system of Claim 65, further comprising means for dropping water pressure a rate operable to cause released gas to propel water removal from the coverage area.

67. The system of Claim 65, further comprising means for lowering water pressure throughout the coverage area of the subsurface zone while a subsurface aquifer continues to supply additional water to the coverage area.

68. The system of Claim 65, wherein the gas comprises methane.

69. The system of Claim 68, wherein the drainage pattern is formed in virgin reservoir conditions, further comprising producing the methane in a self sustaining flow.

70. The system of Claim 69, further comprising reaching a maximum gas production rate within four months of a start of water production.

5        71. The system of Claim 69, wherein the average area comprises a substantially non-disputed area of the subsurface zone.

72. The system of Claim 68, further comprising  
10        producing a bulk of recovered methane within six months of a start of water production.

73. The system of Claim 65, wherein the coverage  
15        area comprises a substantially symmetrical area of the subsurface zone.

74. The system of Claim 65, wherein the coverage  
20        area extends to any point in the subsurface zone horizontally between any two of the cooperating bores.

75. The system of Claim 65, wherein the pressure differential within the coverage area is less than or equal to 10 pounds per square inch (psi).

25        76. The system of Claim 65, further comprising:  
              means for producing water through the cooperating bores of the drainage pattern to a cavity;  
              and  
              means for lifting water from the cavity to the  
30        surface.

5            78. The system of Claim 76, wherein the cavity has a  
horizontal area greater than or equal to 50 square feet.

79. A method for producing coal seam gas from a coal seam comprising:

forming a drainage pattern in a coal seam, the drainage pattern comprising a plurality of auxiliary  
5 drainage bores arranged in substantially equal and parallel spacing on opposite sides of an axis of the drainage pattern; and

simultaneously producing water and coal seam gas from the coal seam through the drainage pattern.

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80. The method of Claim 79, wherein the drainage pattern further comprises a central bore from which the auxiliary drainage bores extend.

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81. The method of Claim 80, wherein the auxiliary drainage bores are generally symmetrically arranged on each side of the central bore.

82. The method of Claim 79, further comprising  
20 simultaneously producing water and coal seam gas from an area of the coal seam, the area having relatively equal length to width ratios.

83. The method of Claim 79, wherein the drainage  
25 pattern comprises a substantially horizontal pattern.

84. The method of Claim 79, further comprising forming an enlarged diameter cavity, the drainage pattern extending from the enlarged diameter cavity; and  
30 simultaneously producing water and coal seam gas from the coal seam through the enlarged diameter cavity.

86. The method of Claim 79, wherein the auxiliary drainage bores are progressively shorter as they progress away from a surface well bore.

87. A method for producing formation gas from a gas bearing formation, comprising:

forming a drainage pattern in a gas bearing formation, the drainage pattern comprising a plurality of  
5 auxiliary drainage bores arranged in substantially equal and parallel spacing on opposite sides of an axis of the drainage pattern; and

simultaneously producing water and formation gas from the gas bearing formation.  
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88. The method of Claim 87, wherein the drainage pattern further comprises a central bore from which the auxiliary drainage bores extend.

89. The method of Claim 88, wherein the auxiliary drainage bores are generally symmetrically arranged on  
15 each side of the central bore.

90. The method of Claim 87, further comprising  
20 simultaneously producing water and formation gas from an area of the gas bearing formation, the area having relatively equal length to width ratios.

91. The method of Claim 87, wherein the drainage  
25 pattern comprises a substantially horizontal pattern.

92. The method of Claim 87, further comprising forming an enlarged diameter cavity, the drainage pattern extending from the enlarged diameter cavity; and  
30 simultaneously producing water and formation gas from the gas bearing formation through the enlarged diameter cavity.



93. The method of Claim 92, wherein the enlarged diameter cavity comprises a diameter of approximately eight feet.

5        94. The method of Claim 87, wherein the auxiliary drainage bores are progressively shorter as they progress away from a surface well bore.

10       95. The method of Claim 87, wherein water and formation gas are produced from a substantially quadrilateral area of the gas bearing formation.

15       96. The method of Claim 87, wherein the drainage pattern provides substantially uniform coverage of an area of the gas bearing formation.